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1 399 728

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(54) A METHOD OF CONDITIONING FABRICS

(71) We, ECONOMICS LABORATORY INC., a corporation organised and existing under the laws of the State of Delaware, United States of America, of Osborn Building, Saint Paul, Minnesota, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of conditioning fabrics, and a dispenser for fabric-conditioning agents.

In laundering it is common to treat various types of fabrics such as wool, cotton, silk, nylon, polyester and permanent-press with chemicals which are fabric-conditioning or treating agents to render the fabrics soft to the touch, to reduce tangling, knotting or wrinkling, to render them free of static electricity, to render them bacteria-resistant, to deodorize them, and to otherwise condition them. The use of fabric conditioners permits dried clothes to be sorted and folded more easily and quickly. These results are ordinarily achieved by introducing an aqueous solution or dispersion of the fabric-conditioning agent into the wash water during the washing cycle of the laundry process or by introducing such an aqueous solution or dispersion of fabric-conditioning agent into the rinse water during the rinsing cycle of the laundry process. Experience has shown that addition of the fabric-conditioning agents during the rinse cycle of the laundry process is often significantly more effective than addition of the fabric-conditioning agents during the wash cycle. Since some clothes washing machines do not have automatic fabric softener dispensers, the fabric conditioner must be added manually during the rinse cycle. This is inconvenient and, consequently, is often forgotten. Even when the washing machine is equipped with an automatic dispenser, the use of a fabric-conditioner is still a messy operation requiring the measurement of a liquid suspension, is wasteful and is ecologically undesirable because a significant amount of the fabric conditioner is lost to the drain. Moreover, the fabric softener is usually added to the deep rinse where some soap or detergent and soil may still be present, leading to redeposition problems and interaction between the anionic detergent and cationic softeners (which are mutually incompatible), with subsequent loss of efficiency.

The use of liquid fabric conditioning agents in machine dryers has been suggested in the past, but the idea has not gained widespread commercial acceptance probably as a result of such factors as the need for complex dispensing equipment.

Recently, it was suggested in U.S. 3,442,692 that chemicals which are fabric-conditioning agents might be applied to fabrics by tumbling or co-mingling the fabrics in a laundry dryer in contact with a flexible substrate such as paper or cloth which has been impregnated with a chemical which is a fabric-conditioning agent. The chemical agent is presumably transferred to the fabrics to be conditioned by the tumbling action of the fabric within the dryer. Although this approach has some advantages, it suffers from the disadvantages of cost (e.g. a flexible substrate must be impregnated). Additionally, the substrate must be disposed of after it has been used, thereby presenting ecological problems.

The present invention is based on the discovery that desired fabric properties (e.g. anti-static properties) can be obtained by treating the fabric in a machine dryer with a very small amount of a fabric-conditioning agent such as an anti-static agent, which agent is present in a reusable form. According to the invention there is provided a method wherein a fabric-conditioning agent is consolidated reusable form is secured to a wall of a dram of a machine dryer, the agent being in a form which is heat-softenable at temperatures within the operating temperature range of the dryer, the agent being contained within a dispenser, at least a portion of which can be permeated by the fabric conditioning agent and the fabric is tumbled in the dryer by rotation of the drum, thereby causing some of the fabric conditioning agent to be transferred to the

[P

fabric by contact between the tumbling fabric and the permeable portion of the dispenser. For example, an anti-static agent can be formed into a bar (e.g. like a bar of soap) which is encased within a close fitting cloth envelope. This cloth envelope is preferably mounted on a leading edge of one of the dryer vanes, which vanes form a part of the drum wall. The bar will have a softening or melting point within the range of the dryer temperature. When the fabric to be treated is tumbled within the heated dryer drum, anti-static agent passes through the cloth envelope and is transferred to the fabric.

Referring to the accompanying drawings:

Figure 1 is a front view of a machine dryer;

Figure 2 is a perspective view of a cloth dispenser useful in the practice of the present invention;

Figure 3 is a cross-sectional view along the line 3—3 of the dispenser shown in Figure 2; and

Figure 4 is a perspective view of an alternative dispenser.

Figure 1 shows a machine dryer 1. The dryer 1 includes a heat source (not shown) which may for example be electric or gas powered. The dryer is provided with a rotatable drum 2, an exhaust 3, an access door 4 and a latch 5.

The drum 2 has a plurality of vanes 6 which extend inwardly from its cylindrical wall and which are generally parallel to its axis of rotation. Although drum 2 might rotate in either direction, it has arbitrarily been shown in Figure 1 to rotate in a clockwise direction. A dispenser 7 is carried by one of the vanes 6. The purpose of the dispenser 7 is to distribute a fabric-conditioning agent on to a fabric 8 which is tumbled within the drum 2. As is shown in Figure 1, the dispenser 7 is secured to a leading edge of one of the vanes 6. However, if desired, several dispensers 7 can be attached to a single vane 6 or several dispensers 7 can be attached to different vanes 6. Although the dispenser 7 can be loosely tumbled with the clothes or other fabric 8 (i.e. it does not need to be attached to the drum), attaching the dispenser 7 to the drum 2 avoids the disadvantage of having to sort the dispenser out of the clothes 8 after each dryer load. Moreover, various locations of the dipsenser 7 on drum 2 can be used to alter dispensing rates or compensate for different dryer types, makes, temperatures, drying cycles, and the like.

In operation, a fabric 8 (usually damp and ready to be dried) is placed within the drum 2 and tumbled by rotation of the drum 2. In this manner, the fabric 8 is brought into repeated contact with a dispensing surface of dispenser 7. The heat from the dryer causes the fabric-conditioning agent to soften and be transferred to the fabric 8 by contact between the tumbling fabric 8 and the dispensing surface of the dispenser 7.

It has been observed that after a dispenser has been used (e.g. a cloth or bag dispenser), beneficial anti-static properties can be obtained for a cycle or more by merely tumbling dry clothes in an unheated dryer. Presumably, fabric-conditioner which is on the outer surface of the dispenser is transferred to the fabric through abrading contact with the fabric.

The details of construction of the dispenser 7 of Figure 1 are shown in more detail in Figures 2 and 3. The dispenser 7 consists of an outer envelope or shell 9, at least a portion of which must either expose or be permeable to the bar or other mass of fabric-conditioning agent being used. It is convenient and economical to construct the envelope 9 from a cloth or fabric (whether woven or non-woven). Cotton-polyester (e.g. Dacron) twill is a particularly effective material of construction (Dacron is a Trade Mark). The envelope or shell 9 contains a bar 10 of solid or semi-solid material comprising a fabric-conditioning agent. This bar 10 is designed to have a melting or softening point within the range of the dryer temperature. Secured to one side of dispenser 7 is means for selectively attaching the dispenser 7 to one of the dryer vanes 6. As is shown in Figure 3, this means of attachment comprises a mateable woven hook 11 and loop 12 fastener. The loop portion 12 of the fastener is desirably attached to a double-faced, pressure sensitive adhesive pad 13. Alternatively, some means for attaching the dispenser 7 could be carried by the drum 2. Any number of snap or other type fasteners which would permit easy and convenient fastening and unfastening of the dispenser 7 can be used.

An alternative dispenser 7 is shown in Figure 4. As shown in this embodiment, the dispenser comprises an envelope of permeable material 9' which at least partially surrounds a heat softenable bar of fabric-conditioning agent. This bar, contained within envelope 9', is retained in a plastic bracket 14 by means of a spring clip 15. Means (not shown) are provided for attaching the bracket 14 to a surface of dryer drum 2.

Fabric-conditioning agents can be used which comprise chemicals which can be formed into bar which will soften when heated in a laundry dryer. Liquid fabric-conditioning agents cannot be used unless they are either impregnated or coated on a non-interfering carrier which is a heat softenable solid or they can be formed into a suitable gel. Thus, the use of solid and semi-solid fabric-conditioning agents is preferred over the use of liquid agents which are formed into a heat softenable mass.

A particularly useful class of fabric-conditioning agents comprises the quaternary ammonium salts, preferably the chlorides con-

taining at least one and usually two C_{12}—C_{24} fatty acid radicals (e.g. C_{18} radicals). One preferred product is dimethyl di-(hydrogenated tallow) ammonium chloride, whether used alone or in a mixture with other chemicals. If desired, two or more fabric-conditioning agents can be blended together. Additives can be used to improve bar-forming characteristics, to modify the softening point of the bar, and to control the rate of migration or penetration of the agents through the permeable surface of the dispenser 7.

A particularly useful mixture of fabric-conditioning agents is a mixture of stearyl dimethyl benzyl ammonium chloride and dimethyl di-(hydrogenated tallow) ammonium chloride in a weight ratio of 2 to 4:1.

The bars containing a fabric-conditioner should have a melting or softening point within the operating temperature range of the dryer. It is helpful if the bar melts or softens over a wide range of temperatures, rather than a sharply defined melting point. For many machine dryers, bars having a melting point range of at least 10 Centigrade degrees, and preferably at least 20 Centigrade degrees are preferred. At the present time, the optimum melting point of the bar appears to be within the range of 50°—90°C.

The present invention is further illustrated by the following specific Examples. Unless otherwise indicated, all parts and percentages are by weight.

Example 1.

72 parts of stearyl dimethyl benzyl ammonium chloride (melting point of 59°—65°C.), 25 parts of dimethyl di-(hydrogenated tallow) ammonium chloride (melting point of 139°—144°C.) and 3 parts of the monoethanolamide of coconut ail fatty acid (melting point of 62°—65°C.) were mixed together as powders to form an intimate mixture having a melting point of 53°—85°C.

Two pieces of white 65% Dacron/35% cotton twill fabric measuring approximately 2-3/4 inches by 2-3/4 inches were cut. One piece of woven hooked fastener (Velcro, Trade Mark) was sewn to the centre of one side of one of the pieces of twill. The underside of the mating piece of a woven loop fastener (Velcro) was covered with a double-faced pressure sensitive adhesive strip. The side of the pressure sensitive tape which was not in contact with the bottom of the loop side of the fastener was allowed to remain covered with release paper to protect the adhesive properties of the strip until such time as it was desired to bond the loop portion of the Velcro pad to a surface of a machine dryer. Next, the two pieces of twill were sewn together in a facing relationship (with Velcro facing inwardly) along three edges to form a small bag which was then turned inside out. 8—10 grams of the mixture of fabric-conditioning agents was then placed in the bag and the bag was sewn shut. The bag and its contents were then heated in a hot air oven (105°—110°C.) to cause the fabric-conditioning agents to soften and fuse together. Upon cooling, the contents of the bag formed a flat hard bar which adhered to the walls of the sealed bag or cloth envelope.

Next, the direction of rotation of the drum of a home machine dryer was determined by closing the dryer door, turning the dryer momentarily on, and then opening the door and observing the direction of rotation. A leading edge of one of the drum vanes was selected for attaching the dispenser just described. The area where the dispenser was to be attached was then cleaned with water and wiped dry. Next, the release paper was removed from the double-faced tape on the back of the dispenser and the dispenser was pressed against the drum vane to firmly attach it to the vane generally in the mid position (from the front to the back of the drum) and so that the edge of the dispenser nearest the axis of drum rotation was near the innermost edge of the drum vane but did not overhang the edge of the drum vane. The hook and loop portions of the fastener attached to the bag were then separated by lifting one end of the dispenser pouch until the pouch became completely detached from the loop portion of the fastener. The remaining half of the fastener (i.e. the loop portion) was then securely attached to the drum vane by firmly pressing with the fingers. The pouch portion of the dispenser was then replaced making certain that the loop and hook portions of the fastener were properly aligned.

A normal load of damp fabric was then placed in the dryer and dried in the usual manner. When removed from the dryer, the fabrics were tested for static electricity and clinging. The results were excellent. No static or clinging were noted.

Repeated tests have been made using, for test purposes, a dryer load including socks, towels and nylon tricot. The dryer cycle used was a heavy setting of 60 minutes duration. Static electricity was checked after each cycle by noting clinging and snapping or crackling electrical discharge. Controlled tests in which the fabric softener and anti-static agent were omitted consistently had static as evidenced by clinging, tangling, and visually observable electrical discharge. By contrast, fabrics dried in a dryer using the dispenser described above showed no static or clinging or tangling tendencies, even after 75 washing and drying cycles. Moreover, use of the present method to impart anti-static and softening properties to the fabric did not materially affect water absorbency as determined according to the procedure described in JAOCS, *42*, 1084, December, 1965. By contrast, the effect on water absorbency for conventional, proprietary, water-based fabric softeners used in the

rinse cycle of the laundry process show pronounced adverse effects on water absorbency.

Example 2.

This Example compares the anti-static properties of fabric treated in a machine dryer with the product of Example 1 to the anti-static properties of fabric treated in a washing machine with three proprietary fabric softener/anti-static conditioners.

Conventional fabric softener/anti-static conditioners are used as liquids which are added to clothes during the rinse cycle of the washing process. Such fabric softeners tend to impair the moisture absorbency of fabrics (e.g. towels and diapers) after repeated use and consequently, they are often used only periodically. This causes a see-saw effect on anti-static and other properties.

In this Example, the anti-static properties of various fabric softeners were compared using nylon tricot fabric with the results being noted "before and after" rubbing with a nylon tricot block. The test method used as AATCC 115-1965 T (American Dyestuff Reporter, May 8, 1967). A fabric softener identical to that of Example 1 was used in every dryer cycle, while the conventional fabric conditioners were used only in cycle 1. The purpose of this test was to simulate the periodic use of the softener/anti-static conditioner and to determine whether or not the effects of the softener/anti-static conditioner would be maintained or would be removed by a single wash. The results which were obtained are shown in Table 1 which follows.

In each instance, the proprietary softeners were added according to their respective manufacturers instructions. Controls 1 and 3 were added during the rinse cycle and Control 2 was added during the wash cycle.

TABLE I

Antistatic Properties of Nylon Tricot

	Example 1		Control 1[1]		Control 2[2]		Control 3[3]	
	Before	After	Before	After	Before	After	Before	After
Start (No Treatment)	++	++	++	++	++	++	++	++
Wash & Dry Cycle–1	–	±	+	±	++	++	–	–
Wash & Dry Cycle–2	–	+	++	++	++	++	–	–
Wash & Dry Cycle–3	–	–	++	++	++	++	++	++
Wash & Dry Cycle–4	–	–	++	++	++	++	++	++
Wash & Dry Cycle–5	–	–	++	++	++	++	++	++

[1] Nu Soft, a product of Best Foods, a division of CPC International.

[2] Rain Barrel, a product of S.C. Johnson & Sons, Inc. (Rain Barrel is a Trade Mark).

[3] Downy, a product of Proctor & Gamble Company.

LEGEND

– No static (Cling).

± None in 2 out of 3 Test Pieces.

+ Marginal.

++ Heavy Static.

The relative moisture absorbency was also determined with regard to fabrics treated with the fabric softeners of Example 2. The test procedure used was the re-wettability or wicking test method reported by Grim et al, JAOCS, *42*, 1084, December, 1965. Wick height was measured after ten minutes. Moisture absorbency was poor after the first and second washing and drying cycles for fabrics treated with Controls 1 and 2. The moisture absorbency of fabrics treated with Control 3 was poor after the first washing and drying cycle, but recovered substantially after the second washing and drying cycle. By contrast, the product of this invention (i.e. Example 1) surprisingly gave no measurable impairment in moisture absorbency even after the fifth washing and drying cycle. It is hypothesized that with the product and method of this invention only the surface of the fabric is coated with the fabric-conditioning agent whereas with conventional products (which are used as liquids) the cationic softening agent is absorbed by or on all of the fibres of the fabric.

WHAT WE CLAIM IS:—

1. A method of conditioning fabrics, wherein a fabric-conditioning agent in consolidated reuseable form is secured to a wall of a drum of a machine dryer, the agent being in a form which is heat softenable at temperatures within the operating temperature range of the dryer, the agent being contained within a dispenser, at least a portion of which can be permeated by the fabric conditioning agent, and fabric is tumbled in the dryer by rotation of the drum, thereby causing some of the fabric-conditioning agent to be transferred to the fabric by contact between the tumbling fabric and the permeable portion of the dispenser.

2. A method according to Claim 1, wherein the dryer is heated while the drum is rotated, thereby softening said agent.

3. A method according to Claim 1 or 2, wherein the fabric-conditioning agent is in the form of a bar.

4. A method according to any preceding claim, wherein the dispenser is secured to the leading edge of a dryer drum vane.

5. A method according to any preceding claim, wherein the dispenser is made in part from the cloth and wherein the agent exudes from the dispenser through the cloth when the dispenser is heated.

6. A method according to Claim 5, wherein the dispenser is removably attached to the dryer vane.

7. A method according to claim 6, wherein the dispenser is attached by the use of a woven loop and hook fastener.

8. A method according to any preceding claim, wherein the agent comprises a quaternary ammonium chloride containing at least one C_{12}—C_{24} fatty acid radical.

9. A method according to any preceding Claim wherein the dispenser comprises at least one surface made of cotton-polyester fabric and wherein the agent comprises dimethyl di (hydrogenated tallow) ammonium chloride, the melting point of the agent being within the range of 50°—90°C. and extending over at least a 20 Centigrade degree range.

10. A method according to any preceding Claim, wherein the agent is a mixture comprising stearyl dimethyl benzyl ammonium chloride and dimethyl di (hydrogenated tallow) ammonium chloride in a weight ratio of about 2 to 4:1.

11. A heat activated dispenser for normally solid fabric-conditioning agents, comprising a body containing a fabric-conditioning agent in consolidated reusable form; the agent being heat softenable at the elevated temperatures reached during operation of a machine clothes dryer, at least one of the surfaces of the body being permeable so that the agent can penetrate therethrough when heated, and means for attaching the body to a wall of a drum of a machine dryer.

12. A dispenser according to claim 11, wherein the means for attaching the body to a wall of a machine dryer includes a woven loop and hook fastener.

13. A dispenser according to claim 11 or 12, wherein the permeable surface is made of cloth.

14. A dispenser according to claim 13, wherein the cloth is a cotton/polyester cloth.

15. A dispenser according to any of claims 11 to 14, wherein the body is a cloth bag.

16. A dispenser according to any of claims 11 to 15, wherein the agent contained in the bag comprises dimethyl di (hydrogenated tallow) ammonium chloride.

17. A dispenser according to any one of claims 11 to 16, wherein the agent contained in the bag is a mixture comprising stearyl dimethyl benzyl ammonium chloride and dimethyl di (hydrogenated tallow) ammonium chloride in a weight ratio of about 2 to 4:1.

18. A heat activated dispenser for normally solid fabric-conditioning agents substantially as herein described with reference to the accompanying drawings.

19. A method of conditioning fabrics substantially as herein described with reference to the accompanying drawing.

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1399728 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

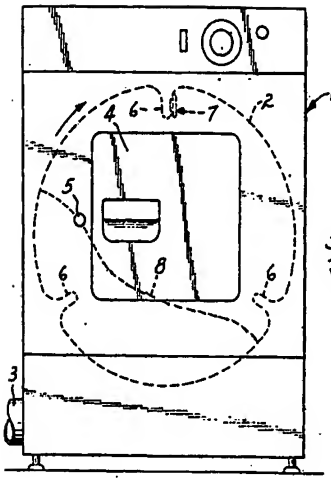

FIG. 1

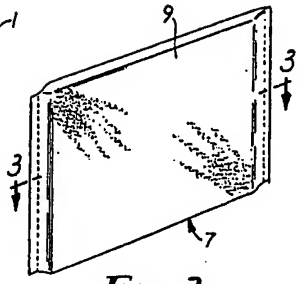

FIG. 2

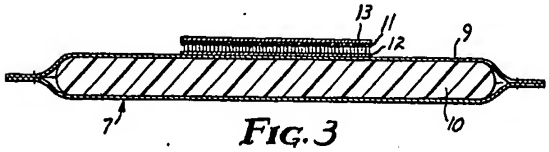

FIG. 3

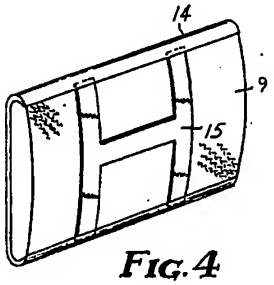

FIG. 4